NEWMARK OPERABLE UNIT REMEDIAL ACTION
NEWMARK GROUNDWATER CONTAMINATION SUPERFUND SITE

REMEDIAL ACTION REPORT

FINAL

Volume I

Prepared for:

Contract No. 68-W-98-225 / WA No. 015-RARA-09J5
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, California 94105

Prepared by:

URS Greiner Woodward-Clyde Federal Services, Inc.
2520 Venture Oaks Way, Suite 250
Sacramento, California 95833

September 2004

APPROVAL FORM

This Remedial Action Report for the Newmark Operable Unit Interim Remedy has been prepared for the United States Environmental Protection Agency (EPA) by URS Group, Inc. (URS). This document presents a summary of the tasks and work performed for the Newmark Operable Unit Remedial Action at the Newmark Groundwater Contamination Superfund Site in San Bernardino, California.

Approved by:

Signature: Elizabeth J. Adams   September 30, 2004
Name: Elizabeth J. Adams   Date
Title: Chief, Superfund Site Cleanup Branch
U.S. EPA Region 9

This page intentionally left blank

DISCLAIMER

This report has been prepared for the United States Environmental Protection Agency (EPA) by URS Group, Inc. (URS). This document presents a summary of the tasks and work performed that are associated with the Newmark Operable Unit (OU) Remedial Action work assignment (WA). The project is at the Newmark Groundwater Contamination Superfund Site (Site), Newmark OU, in San Bernardino, California.

This report has been prepared by URS under the review of registered professionals. The data and conclusions in this report are based on information provided to URS by others and on information from URS contract files. The summaries, interpretations, and conclusions presented in this report were governed by URS' experience and professional judgment.

This page intentionally left blank

TABLE OF CONTENTS

SECTION **<u>Page</u>**

TABLE OF CONTENTS (Continued)

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

This page intentionally left blank.

ACRONYMS AND ABBREVIATIONS

ARCS	Alternative Remedial Contracts Strategy
AS	air stripping
BFV	butterfly valve
CLPAS	Contract Laboratory Program Analytical Services
DHS	Department of Health Services
DI	ductile iron
DTSC	Department of Toxic Substances Control
EPA	Environmental Protection Agency
FS	feasibility study
GAC	granular activated carbon (liquid-phase)
gpm	gallons per minute
kg	kilogram
MCL	maximum contaminant level
MGD	million gallons per day
mg/L	milligrams per liter
ND	no detection
NFA	north field extraction wells
O&M	operations and maintenance
OU	operable unit
PCE	tetrachloroethene
PMP	Performance Monitoring Program
ppb	parts per billion
psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance
RA	remedial action
RAC	Response Action Contracts
RD	remedial design
RI	remedial investigation
ROD	record of decision
RWQCB	Regional Water Quality Control Board
SBMWD	San Bernardino Municipal Water District
SCADA	Supervisory Control and Data Acquisition
SFA	south field extraction wells
TCE	trichloroethene
USGS	United States Geological Survey
VOC	volatile organic compound

This page intentionally left blank.

1.0 INTRODUCTION

This Remedial Action Report summarizes all remedial action (RA) activities and costs for the Newmark Operable Unit (OU), which is a part of the Newmark Groundwater Contamination Superfund Site in San Bernardino, California (see Figure 1-1). The RA activities were performed for EPA by URS Group, Inc. (URS) and the San Bernardino Municipal Water Department (SBMWD).

1.1 BACKGROUND

EPA has been conducting a remedial investigation/feasibility study (RI/FS) for the Newmark Groundwater Contamination Superfund Site since 1990. There are three operable units (OU's) designated at the Newmark Site: the Newmark OU, the Muscoy OU, and the Source OU. Various agencies of the state of California have been involved in the site since 1980. The Newmark OU consists of the original Newmark site, a large chlorinated solvent plume containing tetrachloroethene (PCE) and trichloroethene (TCE) beneath the city of San Bernardino, east of the Shandin Hills. This 7-mile-long plume has caused the closure of several public water supply wells and is threatening downgradient wells that supply water for approximately 600,000 people.

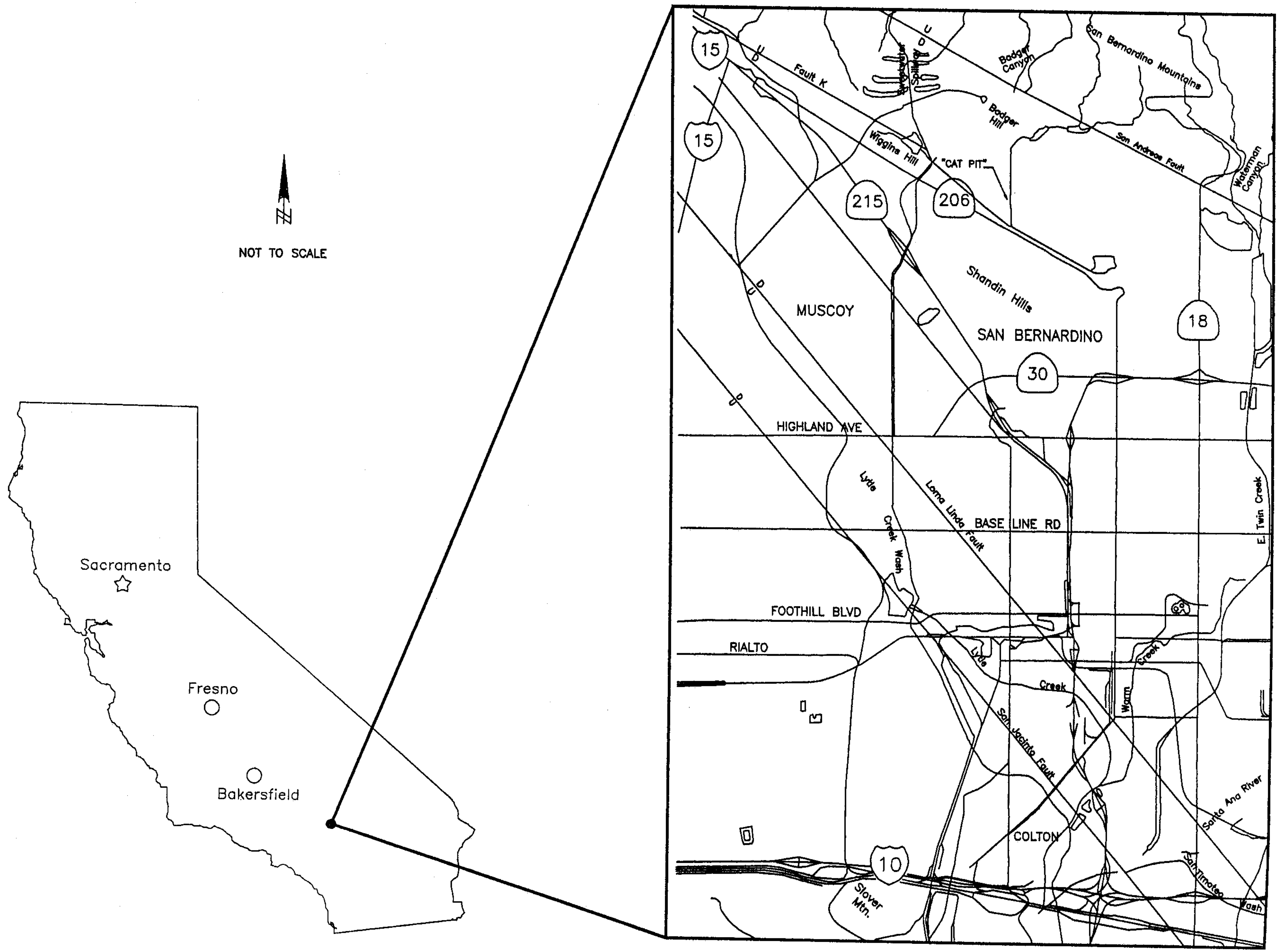
EPA signed the record of decision (ROD) for an interim action for the Newmark OU on August 4, 1993.

In the ROD, the EPA-selected remedy for the Newmark OU involved the extraction and treatment of large volumes of groundwater using two pump-and-treat systems. The two systems are the North Water Treatment Plant (North Plant) and the South Water Treatment Plant (South Plant); the North Plant consists of the Newmark Treatment Plant, and the South Plant includes the Waterman Treatment Plant and the 17th Street Treatment Plant. The remedy will meet the following specific objectives:

- To inhibit the migration of groundwater contamination into clean portions of the aquifer;
- To limit additional contamination from continuing to flow into the Newmark OU Plume area; and
- To begin to remove contaminants from the groundwater plume for eventual restoration of the aquifer to beneficial uses.

EPA has reached an agreement with the local water supply agency, the San Bernardino Municipal Water Department (SBMWD), to accept the treated water from this project in exchange for a reasonable portion of the operating costs. SBMWD owns and operates several production wells, treatment systems, and distribution facilities that are incorporated into the Newmark OU remedy. Coordination with SBMWD continues to be an important component of the Newmark OU RA.

The U.S. Geological Survey (USGS) has produced a basinwide groundwater model, and the current USGS investigator has been cooperating with the U.S. EPA in performing the RI for the Newmark site. The state of California Environ-mental Protection Agency - Department of Toxic Substances Control (DTSC) has been active in investigating this site and providing wellhead treatment systems at the most critical wellfields. DTSC is also the support agency for the project, acting as the coordinator of the state's response to the project. The Department of Health Services - Office of Drinking Water (DHS-ODW) and the Regional Water



URS

NEWMARK GROUNDWATER CONTAMINATION SUPERFUND SITE
SOURCE OU LONGTERM MONITORING AND SAMPLING PROGRAM

Figure 1-1

SITE LOCATION MAP

H:\CADD\Historical\PROJ\MUSCOY\fig1-1.dwg Sep 20, 2004 -- 2:05pm

Quality Control Board (RWQCB), Santa Ana Region, have played important roles at the Newmark site and will continue to be vitally involved. All of the water supply wells that have been affected to date are owned and operated by SBMWD. The wells of several other water purveyors, including the city of Riverside, are threatened by the advancing contaminant plume. The staffs of the various water departments have considerable expertise in technical and practical matters regarding groundwater in the basin.

1.2 PROJECT DESCRIPTION

The RA was implemented at the Newmark OU of the Newmark Groundwater Contamination Superfund Site in accordance with the objectives of the remedial design (RD). The ROD issued on August 4, 1993, defines the selected remedy. The RA is based on the RD to achieve the remedial objectives specified in the ROD. The entire RA includes construction of groundwater extraction wells, construction of water transmission pipelines, construction and renovation of granular activated carbon (GAC) treatment systems, and construction of monitoring wells to assess and modify system performance, followed by an operation and performance monitoring phase, which lasted two years (instead of the normal one-year period). SBMWD operates the treatment facilities, including the extraction wells, and the pipelines. Construction of the entire treatment system was completed in 1998, the performance monitoring phase has been completed, and the system is currently operating as intended.

The RA also involves the continuation of the one-year performance monitoring program for the Newmark OU treatment system. URS will follow the approved *Performance Monitoring Program Field Sampling Plan Addendum to the Source OU LTMP Field Sampling Plan for Newmark Groundwater Contamination Superfund Site, Newmark OU Remedial Action* (URS, 1998a) in monitoring performance at the Newmark OU. Since SBMWD is responsible primarily for operating the treatment system, coordination with SBMWD is essential for the successful implementation of the performance monitoring system.

The Newmark facility locations are shown on Figures 1-2 and 1-3.

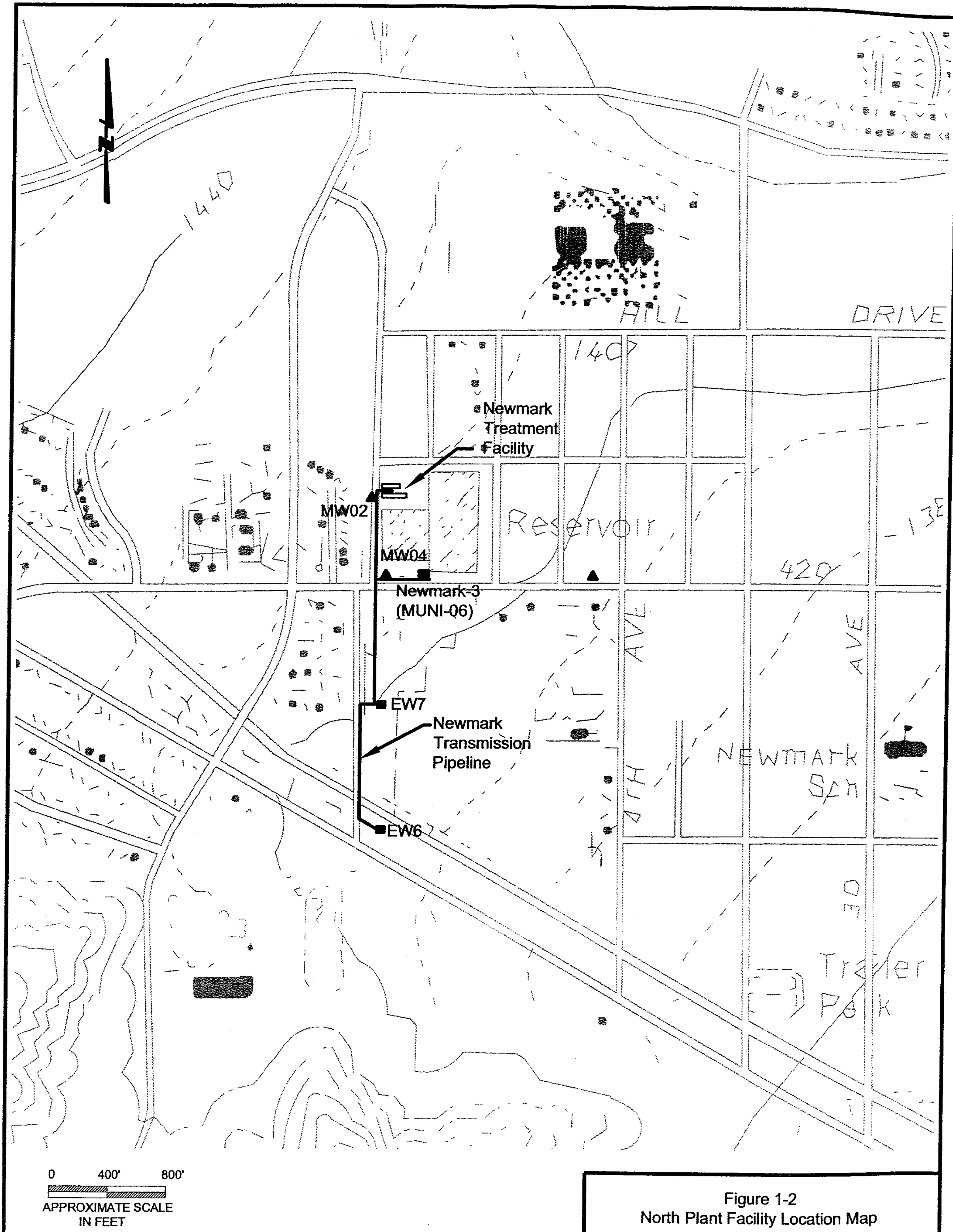
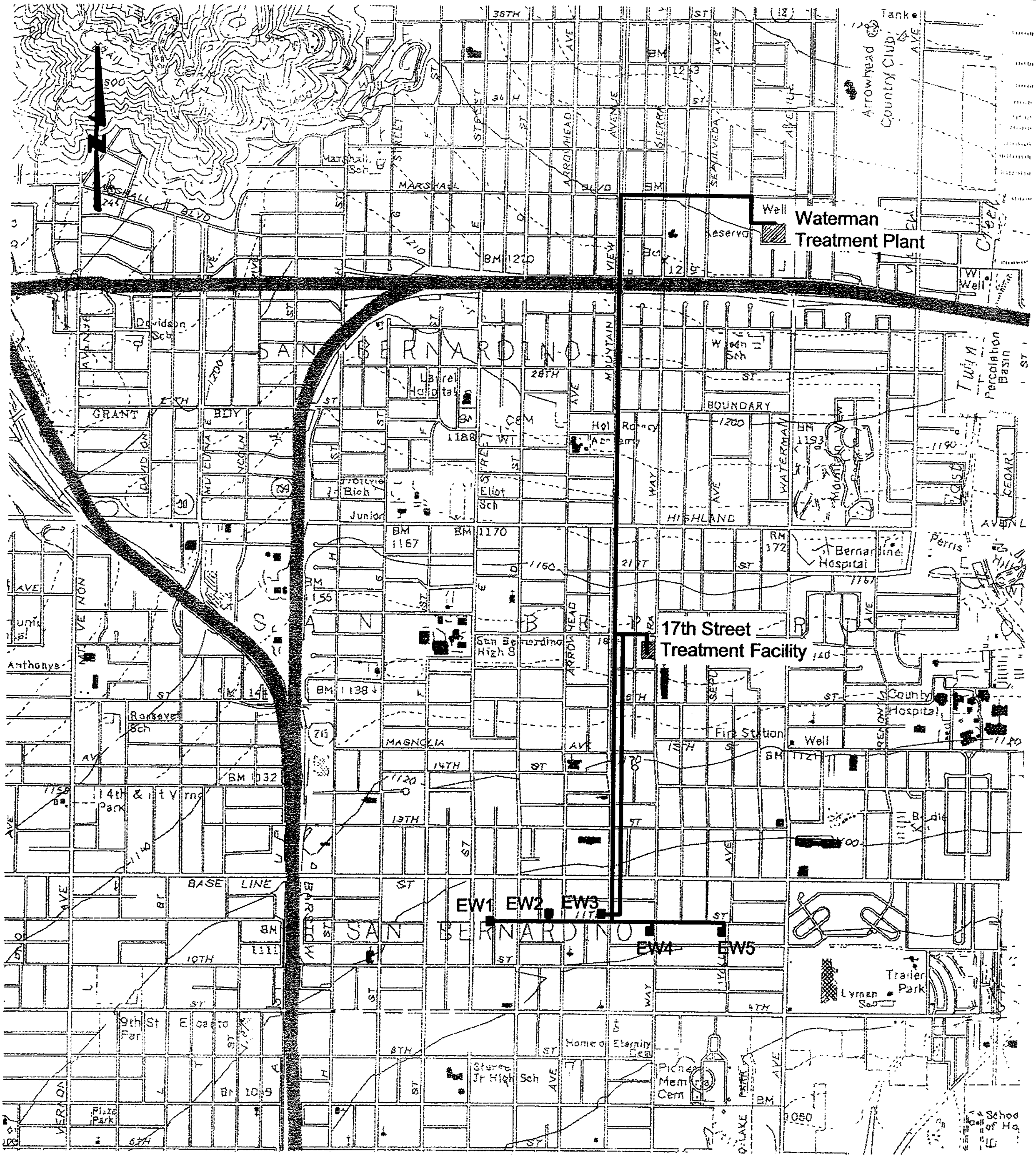


Figure 1-2
North Plant Facility Location Map

DRAWING: H:\CADD\Historical\PROJ\CONSTRUCTION DOCUMENT\NEWMARK\Fig 4-2 SFA WELL TREATMENT FACILITY.dwg



0 1/4

APPROXIMATE SCALE
IN MILES

Figure 1-3
SFA Well and Treatment Facility Location Map

DRAWING: H:\CADD\Historical\PROJ\CONSTRUCTION DOCUMENT\NEWMARK\Fig 4-2 SFA WELL TREATMENT FACILITY.dwg

This page intentionally left blank

2.0 OPERABLE UNIT BACKGROUND

2.1 SUMMARY OF REQUIREMENTS

As presented in the ROD, the RA was developed to meet the following objectives for the Newmark OU:

- To inhibit the migration of groundwater contamination into clean portions of the aquifer;
- To limit additional contamination from continuing to flow into the Newmark OU plume area;
- To begin to remove contaminants from the groundwater plume for eventual restoration of the aquifer to beneficial uses (this is a long-term project objective rather than an immediate objective of the interim action).

The ROD states that the total duration of the Newmark OU interim remedy will be 33 years, with the first three years for design and construction. The ROD calls for treatment by either GAC or air stripping, to be determined during RD; the estimated extraction rates to limit contaminant flow into the Newmark OU plume and to prevent migration of contaminant into clean portions of the aquifer were 4,000 gpm and 8,000 gpm, respectively.

After treatment, the water will meet drinking water standards, or maximum contaminant levels (MCLs), for volatile organic compounds (VOCs).

2.2 SUMMARY OF REMEDIAL DESIGN

The technical design objective was to deliver a treatment system that met all ROD requirements and incorporated the following subsystems:

- Extraction wells (EW);
- Conveyance system;
- Treatment plants; and
- Monitoring wells (MW).

2.2.1 Extraction Wells

RA extraction wells are present at the North Plant and South Plant.

Three North Plant extraction wells (denoted by the City as Newmark Extraction Well No. 3 [Newmark-3], EPA Well No. 6 [EPA-6], and North Extraction Well No. 7 [EPA-7]), provide water to the North Plant water treatment facility. These wells, referred to in this report as Newmark-3, EW-6, and EW-7, are 16 inches in diameter and 495 feet, 360 feet, and 498 feet deep, respectively.

Five South Plant wells (denoted by the City as EPA-1, EPA-2, EPA-3, EPA-4, and EPA-5 and referred to in this report as EW-1, EW-2, EW-3, EW-4, and EW-5) provide water to the South Plant water treatment facility. They are all 16-inch-diameter wells with depths of 810 feet to 1,200 feet.

Typically, each extraction well is equipped with pumps, piping, valves, and controls.

2.2.2 Conveyance System

The conveyance system of pipes and valves provides a way to deliver extraction well water to the treatment plants. The RA conveyance systems include the North Plant pipeline conveyance system, the South Plant pipeline conveyance system, and the 17th Street Plant pipeline.

2.2.2.1 North Plant Pipeline

The North Plant pipeline includes pipelines from EW-6, EW-7, and Newmark-3. From EW-6, a 12-inch ductile iron (DI) waterline directs water west-northwest to Western Avenue. At Western Avenue, the pipeline proceeds north under Western Avenue to EW-7. At Newmark-3, the pipelines from EW-6 and EW-7 are joined by a 12-inch tee. From the tee, the pipeline proceeds north along the flood control channel through a 12-inch by 16-inch reducer. From the reducer, a 16-inch line proceeds north to Newmark-3. The 12-inch pipeline from Newmark-3 joins the 16-inch main pipeline at a 16-inch by 16-inch by 12-inch tee. From the tee, the 16-inch line proceeds north along the flood control channel to the North Treatment Plant. At the North Treatment Plant, the pipeline is connected via a 16-inch by 20-inch reducer and a 20-inch by 24-inch reducer to the 24-inch DI waterline leading into the plant.

2.2.2.2 South Plant Pipeline

The South Plant includes both the Waterman and the 17th Street Plants.

The Waterman Plant includes pipelines from EW-1, EW-2, EW-3, EW-4, and EW-5 and consists of 16- inch DI pipe. Gate valves (GVs) and butterfly valves (BFVs) are used for flow control. The 17th Street Plant includes a pipeline from EW-3. Normal flow from EW-3 is through a 16-inch DI waterline, through a 16-inch BFV, then east to Mountain View Avenue. Normal flow from EW-3 is then north on Mountain View Avenue to the 17th Street Plant.

2.2.3 Treatment Plants

The treatment plants include the North Treatment Plant, also called the Newmark Plant, and the South Treatment Plants, which include the Waterman and the 17th Street Plants. All of these Plants were existing SBMWD treatment plants with either air stripping towers (at the Newmark Plant and the Waterman Plant) or GAC vessels (at the 17th Street Plant). They were expanded as part of the RA with additional GAC vessels to treat the required volume of water as designed by EPA. While the GAC vessels are the primary system used for treating contaminated groundwater, SBMWD maintains a permit for the air stripping towers which can be used in addition to the GAC vessels when needed. Once the treatment plants were built, both GAC and air strippers (only when needed) were used to treat contaminated water from EPA extraction wells

The treatment plants incorporate the equipment between the conveyance piping and the connection to the SBMWD reservoirs. The North Treatment Plant and the South Treatment Plants are described hereafter.

2.2.3.1 North Treatment Plant

The North Treatment Plant is also called the Newmark Plant. The North Treatment Plant treats water from extraction wells EW-6, EW-7, and Newmark-3. Extracted groundwater is treated using GAC to remove the contaminants. However, air stripping towers (which existed previously on site) are available for backup treatment if needed. Treated groundwater is discharged to an SBMWD reservoir. The North Treatment Plant was constructed to treat 5,250 gallons per minute (gpm) or 7.56 million gallons per day (MGD).

2.2.3.2 South Treatment Plants

The South Treatment Plants include the Waterman Treatment Plant and the 17th Street Plant. The Waterman Treatment Plant treats water from extraction wells EW-1, EW-2, EW-4, and EW-5. Extracted groundwater is treated by GAC to remove the contaminants. However, air stripping towers (which existed previously on site) are available for backup treatment if needed. Treated groundwater is discharged into an SBMWD reservoir. The Waterman Plant was constructed to treat up to 6,000 gpm or 8.64 MGD.

The existing 17th Street Treatment Plant included 6 GAC vessels configured as parallel vessels with a single pass. The pipeline was modified as designed in the EPA remedy to turn them into dual pass, with 3 pairs of GAC in parallel, each pair with two GAC vessels in series, with a total capacity of 2,250 gpm. The system is supplied by EW-3. The control and instrumentation was upgraded to match the other treatment plants.

2.2.3.3 Treatment Plant Components

The primary treatment plant components are described hereafter.

Pressure Sustaining Valve (PSV)

The water extracted from the aquifers beneath San Bernardino contains excessive dissolved gasses. These gasses, coming out of solution within the GAC vessels, have the potential to cause air binding of the vessels and short circuiting of fluid flow, resulting in incomplete treatment and inefficient system operation. A pressure-sustaining valve (PSV), PSV-1, is provided in the effluent (treated water) header, upstream from the anti-siphon loop, to maintain a back pressure in the GAC vessels adequate to keep dissolved gasses in solution as they pass through the treatment process. The volume of dissolved gasses changes seasonally, and the PSV may need periodic adjustment. The PSV is operator-adjustable and should be set at approximately 3 pounds per square inch (psi) higher than the minimum pressure that would result in no perceptible buildup of gasses in the GAC vessels. This setting will maximize system operability with a minimum increase in energy consumption.

Isolation Valves

Isolation valves are provided to isolate pieces of equipment so that the equipment can be taken out of service for maintenance. All of the valves on the GAC vessels are BFVs that route water from the manifold to and from the vessels. All of the valves on the influent and effluent header pipes are BFVs that route the water to and from the treatment plants.

Water Sample Valves

Water sample valves are used to sample water at various points throughout the treatment plants. The water samples are collected at different points to determine the concentration of contaminants in the water as it passes through the treatment process. Contaminant concentration information is used to determine the breakthrough of the carbon in the vessels and compliance with the treatment standards.

Air/Vacuum Relief Valves

Air/vacuum relief valves are used to relieve potential excessive gas and pressure or vacuum. They are required to limit pressure-related damage to the equipment. These valves are provided at the top and bottom of each carbon unit and at the highest point of the anti-siphon loop on the effluent pipe.

GAC Units

The Waterman Plant consists of eight pairs of skid-mounted GAC adsorption vessels, while the North Plant consists of seven pairs of skid-mounted GAC adsorption vessels, each containing 20,000 pounds of GAC. The entire GAC vessel package, including piping manifold, instrumentation, and valves, was supplied and installed by Northwestern Carbon of Red Bluff, California. Table 2-1 presents GAC design details. Each vessel pair is equipped with manifolds and valves to allow for either serial (double-pass) or parallel (single-pass) and backwashing flow configuration. Each pair is operated in series under normal operating conditions.

TABLE 2-1

Design Basis for Granular Activated Carbon for North Plant/South (Waterman) Plant

GAC Component	Detail
Carbon System	
Carbon Unit Type	Northwestern Carbon HP-1020
Number of Carbon Units	7 parallel GAC vessels pair systems / 8 parallel pair systems
Carbon Units Operating Mode	Each pair in the system is normally operated in series, although the system can also run in parallel
Total Design Flowrate (gpm)	4,875 / 5,100 (actual vessels size give slightly higher capacity)
Design Flowrate per Pair (gpm)	696 / 637 (actual flow rate slightly higher than design)
Manufacturer's Recommended Design Flowrate per Pair (gpm)	750
Weight of Carbon per Unit (lbs)	20,000
Carbon Usage Rate (estimated) (lbs/day)	445
Estimated Carbon Life (days)	360
Diameter per Vessel (feet)	10
Carbon Unit Height (feet)	≈20
Carbon Unit Shipping Weight (per pair) (lb)	48,000
Carbon Unit Weight (operating, per pair)(lb)	253,000
Carbon Volume per Unit (ft^3)	714
Flange Connection	8-inch pipe
Carbon Unit Pressure Rating (psi)	75 psi
Unit Material	Mild steel
External Coating	Prime and paint
Internal Coating	Epoxy

TABLE 2-1 (Cont'd)

GAC Component	Detail
Carbon	
Type of Carbon	Virgin or Reactivate Filtrasorb 300, or approved equivalent
Apparent Density (lb/ft^3)	28 to 32
Pore Volume (cm^3/g)	0.85
U.S. Standard Sieve Size	8 x 30
Larger than No. 8, maximum	15%
Smaller than No. 30, maximum	5%
Effective Particle Size (mm)	0.8 to 1.0
Moisture, maximum	2%
Iodine Number (AWWA)	900 (minimum)
Abrasion Number, minimum	75
Uniformity Coefficient, maximum	2.1
Abrasion Number, minimum	75
Uniformity Coefficient, maximum	2.1
Backwash	
Maximum Flow (gpm)	1,500
Time (minutes)	15
Volume (ft^3)	3,000
Electrical (Controls)	
Requirements	120 volts, single phase
Location	Existing Transformer/Control Room
Emergency Power	None

AWWA American Water Works Association
cm^3/g cubic centimeters per gram
ft^3 cubic feet
GAC granular activated carbon
gpm gallons per minute
lb pound
mm millimeters
psi pounds per square inch

The nominal empty bed hydraulic contact time is 15 minutes. Flow through each vessel should be maintained below 750 gpm to minimize pressure drop across the vessels. The carbon vessels are rated at 75 psi, and the connected piping is rated at 125 psi. The pressure drop across each vessel at 637 gpm is estimated to be 2.3 psi, or 5.3 feet of water column. A rupture disk assembly is provided to protect each vessel from over-pressurization. The carbon vessels are built of mild steel, externally primed and painted, and internally coated with vinyl ester.

The GAC vessels are equipped with automated safety features, and the treatment plant operation is inter-locked with the existing control panel. The treatment plant instrumentation includes pressure indicators, pressure sensors, rupture disks, flow totalizers, sample valves, and alarms.

Chlorination System

The Waterman and North Plants use a dual-tank, auto-switch-over, flow-paced gas chlorination system to maintain a 0.5 milligrams per liter (mg/L) chlorine residual in treated effluent. The system uses two onsite, 150-pound chlorine cylinders on a scale with a manual set flow-paced dosage control set to 0.5 mg/L. The chlorine feed system automatically adjusts chlorine feed to match the flow rate in the treatment process. The chlorine residual is checked manually three times each day to ensure that the system is operating correctly.

Pressure Gauges

Each GAC vessel is equipped with two pressure gauges and a differential pressure transmitter. Pressure differential is measured between the inlet and the outlet pipe of each vessel. An increase in pressure differential indicates a blockage in the carbon filter. When the differential pressure is greater than 5 psi or lower than 0 psi, an alarm notifies operators of changes in vessel pressure.

Each vessel is equipped with a rupture disk to protect the vessel from over-pressurization. The disk will burst at 75 psi.

Flow Meters

Flow meters are used to record of the amount of water that passes through the system, as described hereafter.

- Each pair of vessels is equipped with a propeller flow meter in the treated water line between the vessel outlet and the treated water header.
- A propeller flow meter is installed in the backwash water supply line. This flow meter records the volume of the city water used for backwashing.
- A propeller flow meter is provided on the effluent header to the reservoir before the anti-siphon loop. This flow meter quantifies the total amount of discharged treated water and is interlocked with the chlorination system for the automatic adjustment of the chlorine dosage.

The flow meters were supplied by the SBMWD to the contractor for installation.

Carbon Vessel Sampling Ports

Each pair of carbon vessels is operated in series. The first vessel in the pair is called the lead vessel; the second vessel is called the lag vessel. Each vessel is provided with water sample ports at the inlet and outlet. Samples collected from the inlet and outlet of the lead vessel are analyzed to detect breakthrough of the carbon in the lead vessel. When carbon breakthrough is identified in the lead vessel, the lead vessel should be scheduled for change-out.

Three additional sample ports are provided on each vessel at 25%, 50%, and 75% of the height of the carbon bed to collect water samples to monitor the percentage of carbon capacity remaining prior to 100% breakthrough. Each vessel is also provided with a carbon sample port from which to collect carbon grab samples to monitor the chemical characteristics of carbon in the vessel.

Each vessel is provided with a 4-inch pipe inlet at the bottom of the vessel to empty the spent carbon. A cone bottom fitted to each vessel facilitates complete emptying of the spent carbon. A 4-inch vertical fill pipe is provided with each vessel for refilling the vessel with fresh carbon.

Backwash System

Water extracted from the new EPA extraction wells is expected to be low in silt and other solids. However, the GAC vessels may experience an increase in pressure drop across the filter media, which will indicate clogging by the accumulation of incidental solids. In this situation, the vessel will be taken offline and the flow through the vessel will be reversed. The purpose of reversing the flow is to expand the carbon bed, which facilitates the dislocation of accumulated solids. The flow rate will be adjusted to achieve sufficient force to dislocate solids and flush them into the spent backwash sump.

Backwash water to the Waterman Plant will be supplied from an existing 20-inch-diameter municipal system water line. An 8-inch pipe header, connecting the existing 20-inch water line, brings the backwash water to the plant. A back-flow preventer and a flow meter are provided in the 8-inch backwash line to the plant. The backwash flow rate will be 800 gpm to a maximum of 1,500 gpm; the rate is adjustable by BFVs at each vessel pair. The spent backwash water generated during a backwash cycle will be collected in two collection sumps for disposal.

Backwash to the North Plant will be supplied from an existing 16-inch plant waterline that connects to the 8-inch backwash supply line.

The spent backwash water generated during a backwash cycle will be collected in two sumps, one along each GAC treatment train. The two sumps are connected using a 12-inch-diameter pipeline. The sump system is designed to hold the backwash volume of one vessel at a flow rate of 1,500 gpm for 15 minutes, or a total volume of 22,500 gallons (or approximately 3,000 cubic feet). The volumes of the sumps are as follows:

- **North Plant Sumps**
  - Newmark Trough 15,184 gallons
  - Newmark Trough 15,184 gallons
- **South Plant Sumps**
  - Waterman Trough 18,000 gallons
  - Waterman Trough 18,000 gallons
  - 17th Street Pit 8,000 gallons (approximately)

It should be noted that one backwash uses approximately 22,500 gallons, but each individual sump does not hold one full backwash.

The spent backwash water at the Waterman Plant is gravity-drained to the storm sewer system on Leroy Street through a 12-inch DI pipe. A 12-inch gate valve is provided in the pipe to allow the water to be retained in the backwash waste reservoir, if required.

The spent backwash water at the North Treatment Plant is pumped to an adjacent storm water channel through a 4-inch force main.

<u>Alarms</u>

The instrumentation and control (I&C) systems are designed to allow automatic normal plant operations with shut-offs, alarms, and an autodialer to notify operating personnel of any malfunctions. Alarms are discussed hereafter.

GAC vessels are operated and controlled manually. The GAC vessels are monitored and alarmed as follows.

- High Differential Pressure Alarm. Initiates local and remote warning alarm to indicate carbon maintenance is required.
- High Differential Pressure Critical Alarm. Initiates local and remote warning alarm to indicate that vessel shutdown and isolation should be performed.

  Note: The differential pressure switches are adjustable relays included within a differential pressure indicator. The indicator is installed on each vessel and provides a visual meter indication of the differential pressure.
- Low Pressure and Low Flow Alarm. Initiates local and remote alarms.
- Total Flow Transmitters (included for each pair of vessels). Transmitters include instantaneous and totalizing local flow indicators and output for remote telemetry.
- Flow Transmitter (included at the effluent pipe header to reservoir). Transmitter includes instantaneous and totalizing local flow indicators and output for remote telemetry.

Local alarms are connected to an annunciator panel in the existing control building. The annunciator panel includes visual and audible indicators and normal annunciator functions (acknowledge, flash, test, silence, and seal-in options).

Remote alarm processing is provided by the existing SBMWD supervisory control and data acquisition (SCADA) control center at 195 North D Street, which has remote shutdown capabilities. Remote alarms are dry contacts from retransmit relays within the annunciator panel. The remote alarm is terminated in an interface cabinet.

2.2.4 Monitoring Wells

Each of the following monitoring well locations has either two or three completions.

2.2.4.1 North Plant Wells

Six monitoring wells are associated with the North Plant. These wells are MW-07, MW-02, MW-04, MW-17, MW-09, and MW-16 (see Figure 2-1). All of these have two completions at each well location.

2.2.4.2 South Plant Wells

Eight monitoring wells are associated with the South Plant. These include MW-130, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, and MW-01. All of these have three completions at each well location.

2.3 CONSTRUCTION ACTIVITIES

Construction activities for the Extraction and Monitoring Wells were documented in the report: "*Extraction System Monitoring Well Installation Technical Memorandum*" (URS Greiner, Inc., 1998b). The Extraction Wells report was provided as Appendix C: "*Extraction Well Installation Technical Memorandum*" of the above report, and included all the logs of the extraction wells.

Construction activities of the remaining work are documented in the construction inspection reports presented in Appendices A1 through A7 of this report for each of the following segments:

- North and South Plants;
- Granular Activated Carbon Vessels;
- Mountain View Overcrossing Bridge Penetration;
- North Plant Transmission Pipeline; and
- South Plant Transmission Pipeline Phase I and II.

The construction inspection reports in the Appendices A1 through A7 include the following information:

- A narrative describing the individual job segment, the contractor(s') tasks and chronology of milestones, any problems encountered and their solutions, quality assurance (QA) testing, agency involvement, change order summary, punch list items, and conclusion;
- Copies of all contractor submittals of QA testing; and
- Copies of correspondence and contractor submittals documenting punch list items and their resolutions.

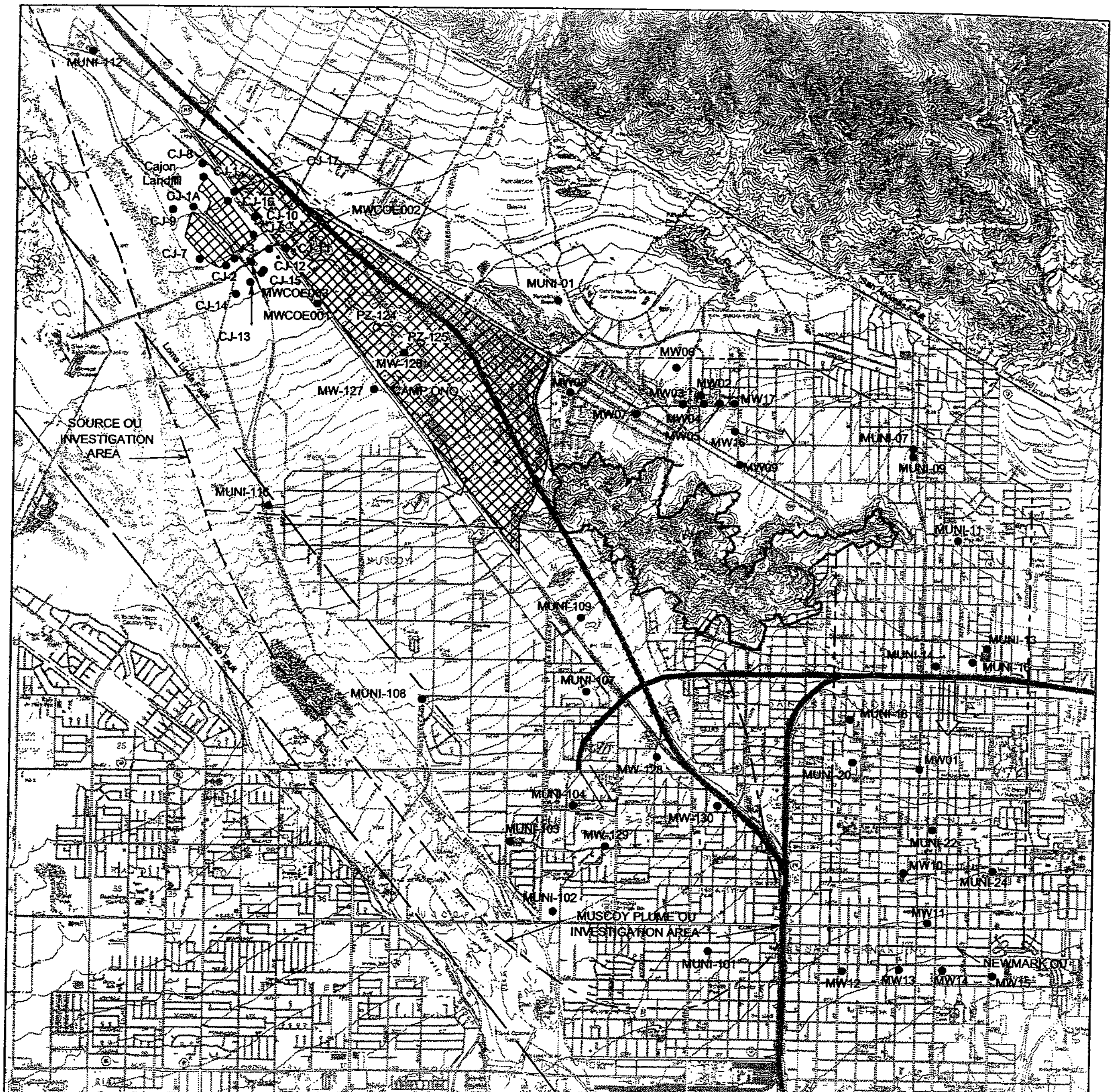
URS provided full- time inspection during all phases of construction, including for pipelines, bridge overcrossing penetration, treatment plants, and monitoring and extraction well drilling. URS inspection was supplemented by SBMWD staff and inspectors from the City of San Bernardino and the San Bernardino County Flood Control District.

Section 6.0, Final Inspection and Certification, discusses the final inspection and its outcomes.

2.4 AMENDMENTS TO THE ROD

In August 2004, EPA issued an Explanation of Significant Differences ("ESD") for the Newmark OU and Muscoy OU Interim RODs. The ESD supplements the interim remedies in the RODs with a requirement for institutional controls ("ICs") wherein the installation of new wells, or operation of spreading basins that might impact the barrier wells, is governed by a permit program or other control mechanism. Such ICs are necessary to assure that the Newmark and Muscoy extraction and treatment systems remain effective in meeting the objectives of capturing contaminated groundwater and inhibiting the migration of groundwater contamination into clean portions of the aquifer. EPA expects that the City of San Bernadino will adopt a local ordinance to provide the ICs required by the ESD. At the time of this report, neither the ESD nor the ordinance is in place.

This page intentionally left blank.



Base Map: USGS San Bernardino Quad

LEGEND

OU Investigation Area Boundary

Faults

Well Locations

Generalized Regional Groundwater Flow Direction

Cajon Landfill And Camp Ono

0 1/2 1

SCALE IN MILES

URS

NEWMARK GROUNDWATER CONTAMINATION SUPERFUND SITE
SOURCE OU LONG-TERM MONITORING AND SAMPLING PROGRAM

Figure 2-1

OPERABLE UNIT AND WELL LOCATION MAP

H:\CADD\Historical\PROJ\MUSCOY\wellmap.dwg

Figure 2-1 (Continued)

3.0 CONSTRUCTION ACTIVITIES

3.1 OVERVIEW

Specific RA construction activities that were contracted by URS and SBMWD included the following:

- Construction contracted by URS:
  - Water treatment plants—North and South Plants, 17th Street Plant controls retrofit, and GAC vessels.
  - Pipeline conveyance system—Freeway bridge overcrossing (south pipeline).
  - Monitoring wells MW-12 through MW-17.

- Construction contracted by SBMWD for which URS performed the inspection:
  - Pipeline conveyance system—North Plant pipelines and South Plant pipeline (three phases).
  - Extraction wells.

The following sections summarize these activities.

3.2 URS CONSTRUCTION CONTRACTS

3.2.1 Water Treatment Plants

The North Plant and South Plant include three separate GAC water treatment plants. The plants remove organic contaminants from groundwater that is pumped to the plants through a system of pipelines. The North Plant treats water pumped from a geologic restriction in the upgradient portion of the plume, and the South Plant treats water extracted from the leading edge of the contaminated groundwater plume.

The North Plant is located at 1265 Reservoir Drive. It includes 14 GAC vessels (20,000 pounds) and has a total design flow rate of 5,250 gpm. The vessels operate in seven serial pairs in parallel.

The South Plant is located on Waterman Avenue, one block north of the Route 30 Freeway. It includes 16 GAC vessels (20,000 pounds), with a total design flow rate of 6,000 gpm. The vessels operate in eight serial pairs in parallel.

The scope of work for the initial phase of construction for both of these water treatment plant sites included the construction of concrete pads, installation of site pipelines and electrical lines, instrumentation, upgrade of an existing chlorination system, grading, paving, and landscaping. Clearwater Environmental, Inc., (Clearwater) was procured and subcontracted by URS to complete this phase of construction.

URS procured and subcontracted Northwest Carbon, Inc., (Northwest) to fabricate and install the GAC vessels and provide the carbon at both the North and South Plants.

In addition, the 17th Street GAC system is associated with the South Plant system and consists of six vessels. The piping and valving were modified to alter the configuration from parallel (single-pass) to serial (double-pass). Automated safety features also were added to the existing control panel. This retrofit was subcontracted separately with Excel Automation and Electric and was performed from August 1998 to October 1998. Piping modifications were constructed by the SBMWD.

The construction inspection report for the North and South Plants is presented in Appendix A1. The construction inspection report for the GAC vessels is presented in Appendix A2.

3.2.2 Freeway Bridge Overcrossing (South Pipeline)

The Mountain View overcrossing is part of the South Transmission Pipeline, which connects a series of five extraction wells to the South Plant.

The Mountain View overcrossing is located over the Route 30 Freeway, between 29th Street and 30th Street. The overcrossing consists of a 20-inch TR-Flex DI pipe CL 53 encased in a 30-inch steel pipe. This pipeline is supported by concrete saddles in the interior of the box girder concrete bridge. This section of pipe in the bridge connects a pipeline on each side of the bridge; the pipeline was installed under an SBMWD contract.

William P. Young, Inc., (W.P. Young) was procured and subcontracted by URS to complete the construction.

The construction inspection report for the Mountain View overcrossing bridge penetration is contained in Appendix A3.

3.2.3 Monitoring Wells MW-12 through MW-17

Four triple-completion monitoring wells (MW-12 through MW-15) were installed to monitor groundwater conditions downgradient from the South Plant, and two dual-completion monitoring wells (MW-16 and MW-17) were installed to monitor groundwater conditions downgradient from the North Plant. The *Extraction System Monitoring Well Installation Technical Memorandum* (URS, 1998b) documents the installation of these monitoring wells.

3.2.4 17th Street Crossover Piping and Controls Retrofit

Cross over piping was installed to allow for greater flexibility in conveying groundwater to alternative treatment plants. At 17th Street, a pressure-reducing crossover station will allow water to be diverted from the wells dedicated to the Waterman Plant to the 17th Street Plant.

The power requirements of the liquid-phase GAC (GAC) system are minimal, and the electrical demand will be significantly less than the demand for the air stripping system. No additional power was added to the site. The following controls were added.

- High Differential Pressure Critical Alarm;
- Low Differential Pressure Critical Alarm; and
- Low Pressure and Flow Shutdown.

Local alarms were connected to an annunciator panel in the existing control building. Remote alarm processing was provided by the City's existing SCADA. Remote alarms were dry contacts from retransmit relays within the annunciator panel. The remote alarms were terminated in an interface cabinet. The City performed the final interconnection of alarms, prepared the SCADA software modification / configuration, and tested the alarms.

The annunciator panel includes visual and audible indicators and normal annunciator functions (acknowledge, flash, test, silence, and seal-in options).

3.3 SBMWD CONSTRUCTION CONTRACTS

3.3.1 Pipelines

The scope of work included construction of the North Plant and South Plant transmission pipelines.

3.3.1.1 North Pipeline

This pipeline transfers groundwater from the three extraction wells adjacent to the Western Avenue flood control channel to the North Plant. Installation of the DI pipeline begins at EW-7, extends north along Western Avenue, and turns east to cross beneath a concrete flood control channel. A PG&E conduit also was placed under the flood control channel to provide power to EW-6. At the location of EW-6, on the eastern side of the flood control channel, a tee was installed. The pipeline follows the flood control channel north and crosses 42nd Street. At the location of Newmark-3, a tee was installed to connect to the main pipeline. The pipeline continues north along the flood control channel access road into the North Plant. The pipeline was tied into a raw water supply line (plant influent) for the GAC vessels.

El-Co, Inc., (El-Co) was procured and subcontracted by SBMWD to complete the north pipeline construction. Pipe was installed to each extraction well, and tie-ins were completed by SBMWD.

The construction inspection report for the North Plant transmission pipeline is contained in Appendix A4.

3.3.1.2 South Pipeline

This pipeline transfers groundwater from the five extraction wells on 11th Street to the South Plant. The pipeline construction was performed in three phases.

Phase 1 was constructed primarily to install the 12-inch diameter polyvinyl chloride (PVC) waste pipeline so that EW-3 could be drilled, constructed, and tested. The waste line connected EW-3, on 11th Street west of Mountain View Avenue, and EW-4, on 11th Street and Sierra Way, to a storm drain inlet at 9th Street and Sierra Way. The waste line was routed easterly along 11th Street to Sierra Way, where it turned south to 9th Street. Concurrently, DI raw water pipe was installed in the same trench as the PVC waste pipeline for EW-3 to Sierra Way.

Phase 2 connected EW-1, EW-2, and EW-5 along 11th Avenue to the Phase I raw water pipeline and waste line. EW-1 is the most westerly well and is located at 11th Street and Stoddard Avenue. EW-2 and EW-5 are located at 11th Street. In addition to connecting the wells together, pipeline was constructed that connected EW-3 to the 17th Street Plant, and pipeline was constructed in the same trench that would (in Phase 3) convey water from EW-1, EW-2, EW-4, and EW-5 to the Waterman Plant. The Waterman pipeline was constructed to approximately 21st Street.

Phase 3 included all DI pipeline constructed in Mountain View Avenue from north of 21st Street to Marshall Street, then east on Marshall Street to LeRoy Street, then south on LeRoy Street to Horine Park. The pipeline entered the park on the southern side of an SBMWD reservoir, continued east and then north on the eastern side of the reservoir, and entered the treatment plant. The Mountain View Avenue pipeline reach included a segment constructed through a Caltrans overcrossing over the Route 30 Freeway.

El-Co was procured and contracted by SBMWD to complete the Phase 1 construction. Trautwein Construction, Inc., (Trautwein) was procured and contracted by SBMWD to complete the Phase 2 and Phase 3 construction.

The construction inspection report for the South Plant transmission pipeline, Phase 1 and Phase 2, is contained in Appendix A5. The construction inspection report for the South Plant transmission pipeline, Phase 3, is contained in Appendix A6.

3.3.2 Extraction Wells

The three extraction wells associated with the North Plant are EW-6, EW-7, and Newmark-3. The five extraction wells associated with the South Plant are EW-1 through EW-5. Groundwater from EW-1, EW-2, EW-4, and EW-5 is transferred to the treatment plant at Waterman Avenue. Groundwater from EW-3 is piped directly to the 17th Street system.

The *Extraction Well Installation Technical Memorandum* (Appendix C of URS, 1998b) documents the installation of these extraction wells.

3.4 AGENCY INVOLVEMENT

The following agencies were involved in the construction of the treatment plants and transmission pipelines:

- For the treatment plants, SBMWD monitored the construction and reviewed the results of compaction, hydrostatic, and concrete testing.
- For the pipelines, SBMWD monitored the pipelines, purchased construction materials, and reviewed the results of compaction, hydrostatic, and concrete testing.
- For the pipelines, the San Bernadino Public Works Department was responsible for final road inspection and acceptance.

3.5 HEALTH AND SAFETY AND CONSTRUCTION ACTIVITIES INSPECTION

URS provided full-time inspection during all phases of construction, including pipelines, bridge overcrossing penetration, treatment plants, and monitoring and extraction well drilling. URS inspection was supplemented by SBMWD staff and inspectors from the City of San Bernardino and the San Bernardino County Flood Control District. There were no safety issues during construction.

Appendix A contains the construction inspection reports for the contracts that were summarized in Section 3.0. Each report contains the time frame of significant activities that were performed.

3.6 CONSTRUCTION PHOTOGRAPHS

Photographs were taken throughout construction to help document progress, construction conditions, and construction details. An album of select annotated photographs is presented in Appendix B.

This page intentionally left blank

4.0 CHRONOLOGY OF EVENTS

Table 4-1 presents a chronology of events from 1993 to the present pertaining to the RD and RA. Table 4-2 provides the 1996 through 1998 construction schedule for the RA.

TABLE 4-1

Chronology of Events

Event	Date
Record of Decision Signed	August 4, 1993
Start of Treatment Plant Design	February 1994
Start of Pipeline Design	February 1994
30% Draft Treatment Plant Design Submitted	May 1996
60% Draft Treatment Plant Design Submitted	September 1996
Final Treatment Plant Remedial Design Submitted	July 1997
Final Pipeline Design Submitted	February 1998
Performance Monitoring	October 1998 - July 2000
Ongoing Quarterly Groundwater Monitoring	July 2000 to Present

TABLE 4-2

Construction Schedule

Contractor	Construction Phase	Construction Element	Time Period
URSG	Water Treatment Plants	Newmark North Water Treatment Plant	September 1997 - July 1998
		Newmark South Water Treatment Plant	September 1997 - July 1998
		17th Street Plant Retrofit	August 1998 - October 1998
		GAC Vessels	June 1997 - September 1998
	Pipelines	Freeway Bridge Overcrossing	April 1998 - June 1998
	Monitoring Wells	MW-12 through MW-15	August 1997 - October 1997
		MW-16 and MW-17	October 1997 - November 1997
SBMWD	Pipelines	North Pipeline	March 1998 - October 1998
		South Pipeline	September 1996 - October 1998
	Extraction Wells	EW-6 and EW-7	September 1996-May 1997
		EW-1 through EW-5	September 1996-May 1997

EW = extraction well
GAC = granular activated carbon
MW = monitoring well
SBMWD = San Bernardino Municipal Water District
URSG = URS

5.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

5.1 REMEDIAL ACTION OBJECTIVES

As presented in the ROD, the RA was developed to meet the following objectives for the Newmark OU:

- To inhibit the migration of groundwater contamination into clean portions of the aquifer;
- To limit additional contamination from continuing to flow into the Newmark OU plume area; and
- To begin to remove contaminants from the groundwater plume for eventual restoration of the aquifer to beneficial uses (this is a long-term project objective rather than an immediate objective of the interim action).

After treatment, the water will meet drinking water standards (MCLs) for VOCs.

5.2 FUNCTIONALITY OF REMEDY

The ROD cited air stripping (AS) or granular activated carbon (GAC) adsorption as the two proven technologies to be used to treat contaminated groundwater. During RD, GAC was selected as the preferred treatment technology. The RA included the installation of extraction wells, conveyance, appurtenances, monitoring well GAC units, and the operating and monitoring instrumentation necessary to ensure that the ROD objectives were met.

The Performance Monitoring Program (PMP) performed under the Newmark OU Remedial Action for the Newmark Groundwater Contamination Superfund Site was conducted over 22 months, from October 1998 though July 2000. Details of the PMP are documented in the two documents: i) *Newmark Plume Operable Unit Remedial Action, Newmark Groundwater Contamination Superfund Site, Final Six-Month Operation Report. Newmark Groundwater Contamination Superfund Site, San Bernardino, California* (URS, 2000b), covering October 1998 through April 1999, and ii) *Project Performance Report for the Newmark Plume Operable Unit Remedial Action, Newmark Groundwater Contamination Superfund Site* (URS, 2004a), which covered May 1999 through July 2000. Not all data for these two reports were obtained through the end of the corresponding period of time.

The selected remedy involves groundwater extraction at the leading edge of the contaminant plume and where the contamination enters the eastern part of the valley. Various locations and scenarios for extraction wells and rates of extraction were proposed in the Newmark OU feasibility study (Newmark OU FS) report. However, all design decisions for this interim remedy were made during the RD phase. During the RD phase, the locations proposed for extraction wells and the scenarios for rates of extraction per individual well were selected. The exact number, location, and other design specifics of new extraction wells needed to inhibit the migration of the contaminant plume most effectively were determined during the RD phase. Wherever appropriate, existing water production wells were used for the remedy, and new wells were constructed as necessary, as discussed in the *Remedial Investigation/Feasibility Study Report for Newmark RI/FS Groundwater Contamination Project* (URS, 1993).

All of the extracted contaminated groundwater is treated by GAC adsorption to remove VOCs. EPA determined during the FS (March 1993) that this treatment technology is effective for removing VOCs and has been proven to be reliable in similar applications. It was determined during the RD phase, when more detailed information was available to assess effectiveness and cost, that this VOC treatment technology best met the objectives of the remedy for the Newmark OU. The treated water exiting the treatment plants has met all MCLs and secondary drinking water standards.

5.2.1 Extraction Wells

Extraction wells were operated by SBMWD during the 22-month PMP. Performance was monitored and documented in the two Project Performance Reports referenced above. All extraction wells operated and performed as designed and specified. During the performance period, the North Plant extraction wells appeared to meet the remedial action objective of reducing the mass of contaminated groundwater entering the Newmark plume. This is demonstrated through the mass of PCE and TCE removed by the North Plant. The North Plant extraction wells pumped a total of 2,808 million gallons of water, and the treatment plant removed 67.8 kilograms (kg) and 8.2 kg of PCE and TCE, respectively. During the same period, the South Plant extraction wells appeared to be meeting the remedial action objective of inhibiting further migration of the PCE and TCE plumes. This is demonstrated through groundwater level and gradient data collected during the 22-month PMP, which demonstrates an inward groundwater gradient as the result of groundwater extraction along the leading edge of the plume. The South Plant extraction wells pumped a total of 6,585 million gallons of water, and the treatment plants removed 38.8 kg and 12.4 kg of PCE and TCE, respectively.

5.2.2 Monitoring Wells

Performance monitoring was conducted from October 1998 through July 2000. Details of the monitoring activities, including sampling and analysis methodologies and frequencies and analytical results, are documented in the two Performance Monitoring reports referenced above.

All monitoring wells are operating and performing as designed and specified.

Monitoring wells MW-10 and MW-11 were selected to evaluate contaminant concentrations upgradient from the Waterman wellfield and 17th Street treatment facilities. The sample results from MW-10C and 11B indicate generally stable PCE and TCE concentrations prior to the system start up (MW-10C PCE 3-10 ppb, TCE 1-4 ppb; MW-11B PCE 1-8 ppb, TCE 1-3 ppb). A general increase of PCE concentrations after system start up was noted (MW-10C PCE 6-17 ppb, MW-11B PCE 1-8 ppb) while TCE concentrations stayed the same or decreased between May 1999 and July 2000. Sample results for both TCE and PCE from MW-11A and MW-10A have been non-detect or less than 1 ppb over the same period.

Monitoring wells MW-12 through MW-15 were selected to monitor possible breakthroughs of contaminants between and downgradient from the Waterman wellfield and 17th Street treatment facilities. All sample analyses from MW-14C consistently indicated the presence of TCE and PCE, while MW-14B consistently indicated no detection (ND) for PCE and TCE, and MW-14A consistently indicated small (less than 1 ppb) amounts of PCE and TCE. The sample results from MW 14 should continue to be monitored to evaluate the performance of the extraction well network. Note that the concentrations start dropping after this reporting period. Out of 18 sample analyses from MW-15B, one indicated a minor amount of PCE; the remainder of the samples were ND for PCE and TCE. Sample analyses from MW-15C were ND throughout the PMP.

Monitoring wells MW-02, MW-04, and MW-07 monitor contaminant concentrations upgradient from the Newmark wellfield. The sample results from the upgradient wells have been stable over the reporting period. TCE concentrations from the upgradient wells have ranged from ND in MW-2A and MW-4A to a maximum of 2 ppb in MW-2B over the reporting period. PCE concentrations have ranged from ND in MW-4A and MW-2A to 1 ppb in MW-4B and a maximum of 16 ppb in MW-2B.

Monitoring wells MW-09, MW-16, and MW-17 monitor breakthroughs of contaminants downgradient from the Newmark wellfield. Sample analyses from wells MW-9B, MW-16B, and MW-17B were all positive for PCE and TCE throughout the PMP. Sample analyses from MW-16A initially indicated a minor positive value for PCE, then ND for PCE and TCE for the remainder of the PMP. Sample analyses from MW-17A were all ND for PCE and TCE throughout the PMP.

5.2.3 Treatment Plant Performance

This section summarizes the 22-month performance of the North and South Treatment Plants. Detailed treatment plant operation and performance is documented in the two Project Performance Monitoring reports referenced above. During this performance period, all extraction wells were pumped. Average daily flows treated by the plant GAC systems and air strippers are shown in Table 5-1.

TABLE 5-1

Average Daily Flows Treated

Treatment Area	Treated Water Flow (MGD)
North Plant	4.6
South Plant	10.81

Since the system commenced operation, the City of San Bernardino has sampled the treatment plant influent and effluent water. Table 5-2 summarizes the project performance. The performance results are tabulated in Table 5-3.

TABLE 5-2

Project Performance Summary

Performance Metric	Metric Result
Project status	Ongoing. Report covers period from October 1998 through May 2000.
Types of samples collected	Groundwater samples. Analyzed for VOCs.
Sample frequency and protocol	SBMWD samples all systems quarterly or semiannually .
Quantity of material treated	Approximately 9.39 billion gallons of groundwater were treated from October 1998 through April 2000.

TABLE 5-3

Treatment Performance

Location	Contaminant	Observed Average Influent Concentrations (µg/L)	Observed Average Effluent Concentrations (µg/L)
Newmark Treatment Plant	PCE TCE	6.4 0.8	ND
Waterman Treatment Plant	PCE TCE	0.9 0.4	ND
17th Street Treatment Plant	PCE TCE	3.4 0.86	ND
Observed average effluent concentrations (µg/L) of PCE and TCE at the Newmark, Waterman, and 17th Street Treatment Plants were non-detect.			
Remedial objectives	Effluent standards for treated groundwater (based on the ROD) : TCE - 5 µg/L (MCL) PCE - 5 µg/L (MCL) Containment of the contaminant plume.		
Comparison with remedial objectives	Treatment standards for extracted groundwater have been met to date. Plume containment has been achieved.		
Method of analyses	Method 160.1 for Non-Filterable Residue (=Total Dissolved Solids) Method 160.2 for Filterable Residue (=Total Suspended Solids) Method 200.7 for ICP Metals Method 2320 for Alkalinity Method 415.2 for Total Organic Carbon Method 608 for Organochlorine Pesticides and PCBs Method 624/25ML for Volatile Organics (VOCs/Purgeable) with 25 ml purge for low detection limits Method 625/LL for Semivolatile Organics (SVOCs/BNAs) with liquid-liquid (LL) extraction		
Quality assurance and quality control (QA/QC)	QAPP prepared for project. URS was responsible for QA/QC. Trip blanks, field blanks, equipment blanks, field duplicates, environmental samples, matrix spike and matrix spike duplicate samples were taken.		
Other residues	None generated.		

BNA = base/neutral acid extractables
ICP = inductively coupled plasma
MCL = maximum contaminant level
ml = millliliter
ND = non-detect (ND ranged from 0.5-1 ppb between 1994-2000)
PCB = polychlorinated biphenyls
PCE = tetrachloroethene
QA/QC = quality assurance/quality control
ROD = Record of Decision
SVOC = semivolatile organic compound
TCE = trichloroethene
VOC = volatile organic compound
µg/L = micrograms per liter

The field activities associated with the PMP consisted of water-level monitoring, groundwater sampling, and treatment system performance monitoring. Three PMP activities were related to the full-scale startup of the Newmark OU groundwater extraction and treatment systems. These included the initial start-up of Newmark-3, start-up and optimization of the North and South Plants, and operation and monitoring of the extraction system.

Dedicated data loggers and pressure transducers were installed in the monitoring wells to continuously record water levels. Water levels from the extraction wells/piezometers were supplied by the SBMWD. Ground-water samples were collected prior to full-scale system startup and then monthly for the duration of the startup period from October 1998 to April 2000. Groundwater sampling frequency was reduced to quarterly for the remainder of the one-year operational period.

GAC treatment system performance monitoring ensures that the systems are performing as intended. The objective of the GAC treatment system is to remove the contamination from the extracted water so that the treated water meets effluent requirements. Monitoring is required to ensure that effluent objectives are met, to determine when carbon must be regenerated and backwashing must be performed, and to evaluate operational problems. Treatment system performance monitoring involves collecting and analyzing water samples at the following three locations within the flow streams of the GAC units: the influent sample to the primary GAC unit, the effluent sample from the primary GAC unit, and the effluent sample from the secondary GAC unit.

The first PMP report, the *Newmark Plume Operable Unit Remedial Action, Newmark Groundwater Contamination Superfund Site, Final Six-Month Operation Report. Newmark Groundwater Contamination Superfund Site, San Bernardino, California* (URS, 2000b), presents the results of the first 6-month period of the PMP. Regarding operations, the SBMWD sampled influent water at the water treatment plants from the time that the system commenced operation. Combined treatment plant influent concentrations were slightly above (North Plant) or below MCLs (South Plants), and effluent concentrations were below MCLs. This indicates that the treatment plants were meeting the objective for VOC removal. During the first 22 months of the operational period from October 1998 through July 2000, all extraction wells were operational. Daily average flow of water treated from the north area extraction wells was approximately 4.61 MGD, or 3,200 gallons per minute (gpm). The daily average flow of water treated from the south area extraction wells was approximately 10.81 MGD, or 7,510 gpm. Flow volume and influent and effluent concentrations were used to estimate the mass of PCE and TCE removed by the treatment plants. A total of approximately 106.6 kg of PCE and 20.6 kg of TCE were removed by the three treatment plants during the 22-month operational period. The 15-month operational data are presented in the second PMP report: "*Project Performance Report for the Newmark Plume Operable Unit Remedial Action, Newmark Groundwater Contamination Superfund Site*" (URS, 2004a).

5.3 PERFORMANCE DATA ASSESSMENT

This section summarizes the performance of the GAC treatment plants for the Newmark, Waterman, and 17th Street Plants. The Newmark Plant has seven pair of GAC vessels, the Waterman Plant has eight pair of GAC vessels, and the 17th Street Plant has three pairs of the 20,000-pound GAC vessels. Tables 5-4 and 5-5 include information related to the performance of the three treatment plants: flow volume, PCE and TCE concentrations, and cumulative mass removal.

5.3.1 Flow to the Treatment Plants

During the first 22 months of the operational period (October 1998 through July 2000), all of the north field extraction well and south field extraction well pumping areas were pumped. Daily average flow and total volume of water treated by the GAC vessels and stripping towers is tabulated in Table 5-4.

TABLE 5-4

Treated Water Flow

Pumping Area	Treated Water Flow (MGD/gpm)	Total Volume Treated (gallons)
North Field Wells	4.61/3,200	2,808,000,000
South Field Wells	10.81/7,510	6,585,000,000

gpm = gallons per minute
MGD = million gallons per day

5.3.2 Influent and Effluent PCE and TCE Concentrations

Since the system commenced operation, the City of San Bernardino has been sampling the combined influent water at the water treatment plants. The data in Table 5-5 are averaged over the operational time in this reporting period (22 months). Except for the North Plant, which recorded an average influent concentration of PCE slightly above the MCL, the average PCE and TCE influent concentrations in the treatment plants are below MCLs. All effluent concentrations were below the MCLs. Table 5-5 shows the PCE and TCE design concentrations and the observed average influent concentrations.

TABLE 5-5

PCE and TCE Concentrations

Treatment Plant	Contaminants	Design Average Influent Concentrations (µg/L)	Observed Average Influent Concentrations (µg/L)
Newmark	PCE TCE	35 7	6.4 0.8
Waterman	PCE TCE	35 7	0.9 0.4
17th Street	PCE TCE	35 7	3.4 0.86

PCE = tetrachloroethene
TCE = trichloroethene
µg/L = micrograms per liter

5.4 VOC MASS REMOVAL

Flow volume and influent and effluent concentrations were used to estimate the mass of PCE and TCE removed by the treatment plants. A total of approximately 106.6 kg of PCE and 20.6 kg of TCE were removed by the three treatment plants during the 22-month operational period.

5.5 PERFORMANCE SUMMARY

In summary, daily average flow to each of the treatment plants was below its design capacity. As noted before, only the Newmark plant received influent water concentrations of PCE higher than the California MCL of 5 µg/L. After treatment, the VOCs were at non-detectable levels in the effluent water. This indicated the treatment plants were meeting the design objective for VOC removal.

Observed average influent concentrations of PCE and TCE were lower than the design concentrations. Design concentrations are typically conservative because they are based on the concentrations observed from all of the monitoring wells, including the wells with the highest concentration. The VOC average influent concentrations in the Waterman and the 17th Street plants were below the MCLs. This is because the leading edge of the Newmark OU plume (with TCE/PCE concentration above MCLs) probably has not reached the extraction wells. The treatment plant influent concentrations may increase in the future as the plume reaches the extraction wells.

5.6 GAC AIR EMISSIONS

During operation of the treatment plants, it was noted that there was a constant emission of air from the air relief valves at the base of the GAC units. Sampling revealed the presence of the VOCs of concern (PCE and TCE) with other minor constituents of no concern. The release did not pose an emissions concern as the daily released mass of contaminant was very low. The daily contaminant release mass is tabulated in Table 5-6 for each treatment facility.

TABLE 5-6

Daily Contaminant Release Mass

Treatment Facility	Contaminant Release Mass – (TCE, PCE and Freon 12) lbs/day
Waterman	0.00558
Newmark	0.00949
17th Street	0.00013

lbs = pounds
PCE = tetrachloroethene
TCE = trichloroethene

Air emissions continued until it was noted that flow was impeded through the GAC units.

The points of air release and the measured air volume point to the cause of the air release. Water pressure at the Newmark wellhead was 18 pounds per square inch gauge (psig). Inlet pressure at the plant lead GAC unit was approximately 18 psig. The observed pressure drop across the GAC units was 6 psi, resulting in an outlet pressure of approximately 12 psig. There was no air emission along the pipeline from the wellhead to the inlet of the GAC units, and no air emission was observed from the air release valves at the top of the GAC units.

The solubility of air in water at a given temperature increases with pressure. When pressure is relieved, the water becomes supersaturated with air, and the air is released as a gas. Figure 5-1 shows a plot of the solubility of air in water versus pressure at three different temperatures (15, 18, and 20 degrees Celsius). Initially, the water, at 18 psig, is unsaturated; this point is represented by point A on the graph. As the water flows through the pipeline to the entrance of the GAC units, the pressure drops; this is represented by line A-B. When the pressure reaches the saturation pressure for the water, air bubbles begin to form. As the water flows through the GAC units, there is a 6 psi pressure drop, which is represented by point C. At this point, excess air is being released as a gas from the water from the air release valves at the base of the GAC units. Theoretically, increasing the overall pressure in the GAC units should keep the air in solution, thereby preventing the release of air into the tank and maintaining flow through the GAC units.

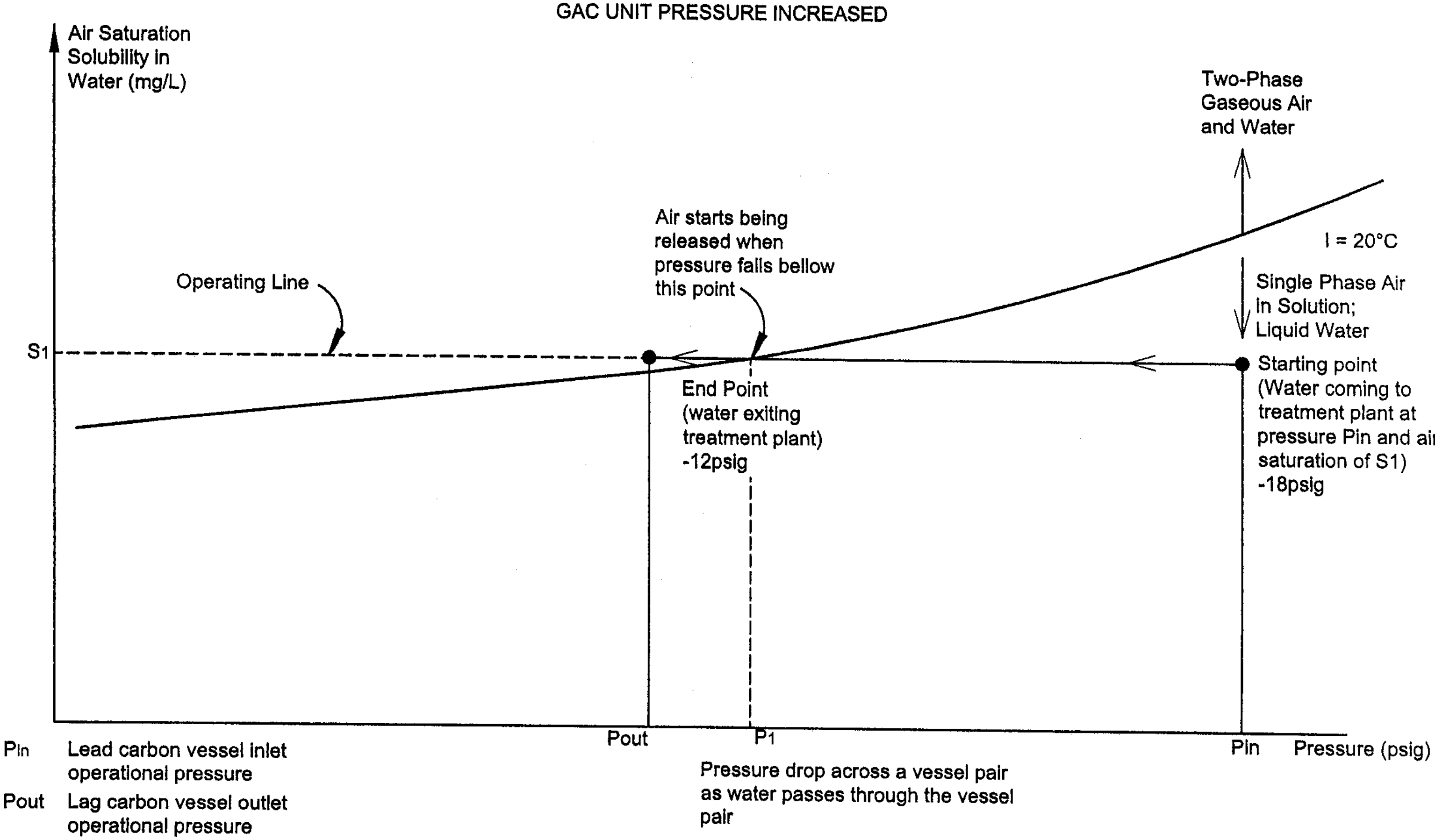
Using PSVs, pressure was increased in the GAC units so that the outlet pressure was increased from 12 psig to 22 psig (See Figure 5-2). Air ceased to be released from the GAC units, and flows through the units continued unimpeded.

5.7 PERFORMANCE DATA QUALITY

Performance Data Quality is described in the *Draft Second and Third Quarter 1999 Report for Newmark Groundwater Contamination Superfund Site, Source Operable Unit, Long-Term Monitoring and Sampling Program* (URS, 2000a) and satisfies CEGS 01440 and CEGS 01450. Groundwater sampling is performed under the *Performance Monitoring Program Field Sampling Plan Addendum to the Source OU LTMP Field Sampling Plan for Newmark Groundwater Contamination Superfund Site, Newmark OU Remedial Action* (URS, 1998a).

All samples were analyzed by either the Contract Laboratory Program Analytical Services (CLPAS) or the Regional Analytical Program (RAP/Region IX laboratory) and are considered definitive, given the QC requirements and detection limits of the analytical methods used by these laboratories.

OPERATING CONDITIONS BEFORE
GAC UNIT PRESSURE INCREASED



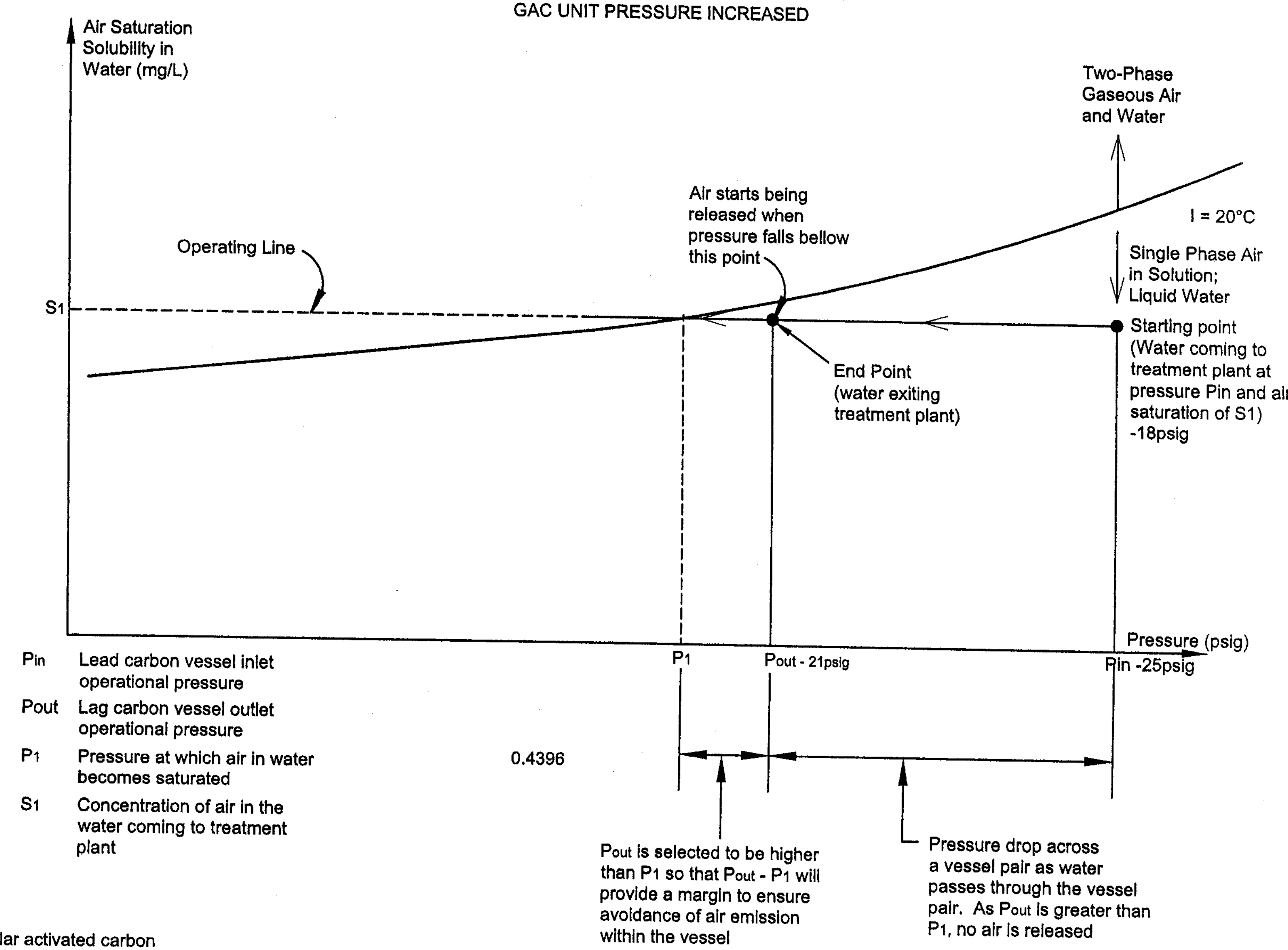
P_{in}	Lead carbon vessel inlet operational pressure
Pout	Lag carbon vessel outlet operational pressure
P_1	Pressure at which air in water becomes saturated
S_1	Concentration of air in the water coming to treatment plant

GAC	granular activated carbon
mg/L	milligrams per liter
psig	pounds per square inch gauge

FIGURE 5-1

H:\CADD\Historical\PROJ\MUSCOY\Figure 5-1.dwg

OPERATING CONDITIONS AFTER
GAC UNIT PRESSURE INCREASED



GAC granular activated carbon
mg/L milligrams per liter
psig pounds per square inch gauge

FIGURE 5-2

H:\CADD\Historical\PROJ\MUSCOY\Figure 5-1.dwg

6.0 FINAL INSPECTION AND CERTIFICATION

6.1 SIGNIFICANT OMISSIONS AT THE TIME OF INSPECTION

Construction final inspections were conducted at various times, as appropriate, on the various facilities (i.e., there was no single OU-wide final inspection). All final inspections were completed by September 30, 1998. There were no significant omissions at the times of final inspections. Construction inspection reports are provided in Appendix A.

6.2 PUNCH LIST ITEMS

A list of punch list items can be found in Appendices A1 through A6. The items all were minor, requiring little rework and having no impact on the project schedule or budget.

6.3 FACILITY OPERATION

6.3.1 Extraction Wells

During the first 22 months of the operational period, from October 1998 through May 2000, all extraction wells operated as intended and met operational specifications.

6.3.2 Monitoring Wells

During the 22-month operational period, significant capture of groundwater in the vicinity of both the North and South extraction systems apparently was maintained; the hydraulic regimes have continued to respond to pumping. However, because pumping from surrounding water supply wells varies, and to maintain successful capture in these areas, additional monitoring of groundwater elevations is critical.

6.3.3 Treatment Plants

During the 22-month operational period, daily average flow to each of the treatment plants was below its design capacity. Only the North Plant received influent water concentrations of PCE higher than the California MCL of 5 µg/L. After treatment, the VOCs were at non-detectable levels in the effluent water. This indicates that the treatment plants were meeting the design objective for VOC removal.

6.3.4 Pipelines

The following new pipe was hydrostatically tested (all piping passed the testing), sterilized with chlorine solution, and flushed:

- Raw water line, North Plant;
- Effluent line and 8-inch backwash supply line, North Plant;
- Raw water line and effluent line, South Plant;
- GAC, North and South Plants;

- Mountain View overcrossing penetration;
- Transmission pipeline, North Plant; and
- Transmission pipeline, Phase 1, 2, and 3, South plant.

6.4 HEALTH AND SAFETY REQUIREMENTS DURING REMEDIAL ACTION IMPLEMENTATION

The City of San Bernardino is responsible for operating the wells and treatment systems and for maintaining compliance with all local, state, and federal health and safety requirements. No health or safety problems were encountered during the operational performance period. All operational personnel were required to complete health and safety training and to wear the appropriate personal protective equipment while performing O&M at the treatment plant and wells.

6.5 REMEDY CERTIFICATION FOR OPERATIONAL AND FUNCTIONAL

The treatment system underwent two years of Performance Monitoring, from October 1998 to October 2000, with two reports on this period. The first report covered the monitoring period from October 1998 to April 1999 (*Newmark Groundwater Contamination Superfund Site, Final Six-Month Operation Report*, August 2000), and the second report covered the monitoring period from May 1999 to July 2000 (*Newmark Groundwater Contamination Superfund Site Project Performance Report*, Jan 2004).

A letter issued on September 29, 2000 (see Appendix C) detailed the needed repair work that was identified during the Operational and Functional period (with an estimate of funds needed for each type of work) and which still needed to be completed as of the end of the Operational and Functional period. These remaining work items do not affect the performance of the system, which has been performing as designed (see the Project Performance Report referenced above), and so the Newmark Operable Unit was transferred to SBMWD to start the Long Term Remedial Action (LTRA) period. A second letter issued on April 2, 2002 officially concluded all construction repair activities on site (see Appendix C)

6.6 INSTITUTIONAL CONTROLS

Institutional Controls as required in the ESD described in Section 2.4 were not in place at the time of the construction of the Newmark OU interim remedy.

7.0 OPERATION AND MAINTENANCE

7.1 GENERAL OPERATION AND MAINTENANCE

The scope of O&M activities is included in the *Newmark Operable Unit, Remedial Action O&M Manual* (URS, 2001a). Performance-related O&M activities are included in the *Newmark Operable Unit, Newmark Groundwater Contamination Superfund Site Cost and Performance Report* (URS, 2004b).

For the Newmark OU, the work described below was performed during the Operational and Functional period, which is part of the RA. Once the O&F period terminated, the Newmark OU was transferred to SBMWD for Long Term RA (LTRA), which lasts 10 years. The official O&M period for the Newmark OU will start after LTRA. Activities during O&M will be similar to those performed during the O&F period, except for some major maintenance at regular intervals or major parts replacement.

Analytical performance monitoring of the 17th Street, Waterman, and Newmark treatment facilities is also part of operation and maintenance (O&M) procedures. Ongoing monitoring of the extraction wells includes monitoring water levels and collecting groundwater samples. GAC treatment system performance monitoring ensures that the systems are performing as intended. The objective of the GAC treatment system is to remove the contamination from the extracted water to meet effluent quality requirements. Monitoring also is required to determine when carbon must be regenerated and backwashing must be performed and to evaluate operational problems. Treatment system performance monitoring involves collecting and analyzing water samples at the following three locations within the flow streams of the GAC units: the influent sample to the primary GAC unit, the effluent sample from the primary GAC unit, and the effluent sample from the secondary GAC unit.

The treatment plant operational procedures are currently monitored regularly. Water flow rates into the treatment plant are recorded daily on a data logger, and the inlet and outlet pressures of the GAC vessels are monitored weekly.

The effluent pipe header is expected to require little maintenance. Periodically, the air accumulated from the flow through the effluent pipe must be released through the effluent pipe air release valve at the top of the anti-siphon loop. Periodic inspection will include a check for any leakage in the pipe. Maintenance of the backwash discharge pipe is the same as that for the effluent pipe header, with the exception of the air release procedure.

Chlorine system maintenance includes checking the chlorine dosage, chlorine residual, and chlorine levels in the cylinders. The electronic sensors must be calibrated as outlined in the manufacturer’s manual. Valves and other individual components must be maintained according to each manufacturer’s instruction manual.

Maintenance of carbon vessels includes monitoring for breakthrough of the lead vessel, coordinating the replacement of spent carbon, routine recording of flow and pressure data to determine the requirements for backwashing, and backwashing to extend the life of the carbon. Periodic operation of valves and checks for leaks and rust also is required.

Carbon has been replaced at all three water treatment plants. Table 7-1 shows the location, date, and amount of carbon replaced at each plant. For the Newmark and Waterman Plants, the indicated dates were the first time carbon was replaced since system startup; the Newmark Plant had a 22-month carbon change-out time, and the Waterman Plant had a 22-month carbon change-out time.

TABLE 7-1

System Carbon Change-Out

Location	Date	Amount of Carbon Replaced (pounds)
Newmark Plant	April 2000	140,000 (7 lead vessels)
Waterman Plant	July 2000	160,000 (8 lead vessels)
17th Street Plant	November 1998	60,000[a]
17th Street Plant	June 1999	60,000[a]
17th Street Plant	May 2000	60,000 (3 lead vessels)

[a] The 17th Street Plant was operating with all six units in parallel. The carbon was partially spent at startup and switched over to series operation.

As presented in Section 5.0, the off-gassing problem associated with the carbon vessels during the initial operational period was solved by installing PSVs.

SBMWD keeps records of maintenance activities at the treatment plant. The forms for record keeping are presented in the *SBMWD Waterman Treatment Plant Operations Plan*. These records include daily, weekly, and monthly operational details (flow rate, total flow, pressure, contaminant loading to the vessels, water quality data, and chlorine record, etc.) and the preventive maintenance performed on the system components (instrumentation calibration, carbon change-out, carbon backwashing, and replacement or repairs of components).

Monitor well maintenance includes periodic repairs to the passive diffusion bag sampling trains, and the periodic repair, replacement or calibration of the water level pressure transducers. Additionally the monitor well are monitored for accumulation of fines in the bottom of the well. In the event that excessive fines accumulate the well may require a re-development evaluation.

Extraction well maintenance includes the periodic evaluation and adjustment of the well flow rates. The required sampling will provide a general picture of the condition of the well. Any variations of these conditions may indicate the need for well maintenance, re-development or disinfection. Periodic pump tests will provide information on the condition of the pumps and motors.

7.2 OPERATION AND MAINTENANCE MANUAL

A *Newmark Operable Unit, Newmark Groundwater Contamination Superfund Site, Operation, Maintenance, and Performance Manual* (OMPM) (URS, 2004c) has been written covering all elements of the Newmark OU remedy. It includes the extraction wells, collection pipelines, treatment plant, and monitoring wells. Each section of the OMPM describes in detail all of the mechanical elements, such as pumps, motors, valves, electrical components, and instrumentation. Each section also provides a detailed description of the system O&M requirements. The monitoring well section provides details on the monitoring program.

8.0 SUMMARY OF PROJECT COSTS

8.1 FINAL COSTS

The total cost of the RA included the cost of the contracts performed by URS, and the cost of the work performed the Cooperative Agreement by SBMWD. The costs for work performed by URS, as described in this report, were approximately $7,702,221, not including EPA administrative and regulatory agency costs. These costs include construction and the period of performance monitoring, which lasted about two years. The costs incurred by SBMWD were approximately $8,734,943, which included the construction costs incurred by the City, the repair cost and the two years of operation cost during the Operational and Functional Period.

RA activities were performed by URS under two EPA contracts. The first was the Alternative Remedial Contracts Strategy (ARCS) contract covering the beginning of the project through 1998, and the second was the Response Action Contracts (RAC) contract covering from 1998 through the present time. RA activities were performed by SBMWD under the Cooperative Agreement V-9994000, which started in 1995 and continues through the present time. Table 8-1 summarizes the final RA costs.

TABLE 8-1

Summary of Remedial Action Costs

Type of Cost	Contractor	Description	Total Value	Total Construction		
1	URSG	Project Management	$393,986			
		Construction Support	$608,455			
		South Plant Contractors	$3,100,377			
		North Plant Contractors	$2,498,345			
		Cleanup Validation	$455,308			
		Treatment Plant	$104,160			
		Performance Monitoring	$513,187			
		Project Completion	$28,403			
		Subtotal		**$7,702,221**		
2	SBMWD	Property Purchase	$361,728			
		Building Demolition	$28,055			
		Health and Safety	$202,430			
		Historical Review	$529			

TABLE 8-1

Summary of Remedial Action Costs

Type of Cost	Contractor	Description	Total Value	Total Construction		
		Community Relations	$7,635			
		South and North Plant	$3,118,244			
		Plant Modifications	$2,702,257			
		South Plant Pipeline	$267,449			
		Construction repair	$809,206			
		Operating cost during	$1,237,410			
		Subtotal		**$8,734,943**		
	Total RA Cost			**$16,437,164**		
Time Period				**Groundwater**	**PCE (kg)**	**TCE (kg)**
October 1998 - July 2000				**9,390,000,000**	**106.6**	**20.6**

kg = kilogram
PCE = tetrachloroethene
SBMWD = San Bernardino Municipal Water Department
TCE = trichloroethene

8.2 COSTS ESTIMATED IN ROD

The selected interim remedy corresponds to Alternative 2 of the ROD, *Extract / Treat (Granular Activated Carbon) / Public Water System* (EPA, 1993). The estimated costs for Alternative 2 are reported in the ROD in Section 11.0, The Seleted Remedy, where they are summarized as “[T]he estimated cost of Alternative 2 has a total present worth of $49,900,000, which is in the middle of the range for all five alternatives.”

The cost estimate for Alternative 2 from the *Remedial Investigation/Feasibility Study Report for Newmark RI/FS Groundwater Contamination Project* (URS, 1993) is summarized in Table 8-2.

TABLE 8-2

Summary of Estimated and Actual Costs for Alternative 2

Description	Estimate in RI/FS	Actual
South Plants Total Capital Cost	$9,005,921	
North Plants Total Capital Cost	$3,250,456	
Total Capital Cost	$12,256,377	$16,437,164[a]
Total Annual O&M Cost (1993 dollars)	$2,448,415	$906,000[b]
Present Worth of Newmark OU Interim Remedy (Construction + O&M) (1993 dollars)	$49,900,000[c]	n/a

[a]While the RI/FS estimates were given by Plant locations, the actual construction costs were incurred by both URS and SBMWD for the respective systems constructed by each party, which included both the North and South Plants as well as all other components of the treatment system. For this reason, the actual cost is given as a total only for comparison to the RI/FS estimate (detailed breakdown of actual costs appears in Table 8-1).

[b]For comparison purpose, this estimate is obtained from the Cooperative Agreement with SBMWD which is responsible for operating the entire treatment system. For the O&F period, the actual annual operating cost was $618,705.

[C]as cited in the ROD

8.3 UNIT TREATMENT COSTS

8.3.1 Quantities of PCE and TCE Removed in the Performance Period

Extraction wells were operated by SBMWD during the 22-month PMP. Performance was monitored and documented in the *Project Performance Report for the Newmark Plume Operable Unit Remedial Action, Newmark Groundwater Contamination Superfund Site* (URS, 2004a). All extraction wells operated and performed as designed and specified. During the performance period, the North Plant extraction wells pumped a total of 2,808 million gallons of water, and the treatment plant removed 67.8 kg and 8.2 kg of PCE and TCE, respectively. During the same period, the South Plant extraction wells pumped a total of 6,585 million gallons of water, and the treatment plants removed 38.8 kg and 12.4 kg of PCE and TCE, respectively.

8.3.2 Treatment Costs

As shown in Table 8-1, the operating cost during the two-year O&F period was $1,237,410. Prorating that figure to a 22-month period results in an operating cost of $1,134,293. Using the total volume of groundwater treated from Table 5-4 for all plants, the cost of treatment is estimated to be $121 per million gallons. For PCE and TCE, a total of 127.2 kg was removed during the 22-month PMP period, which translates to a unit cost of about $8,900/kg contaminant removed during the 22-month PMP period.

8.4 COST OF PERFORMANCE MONITORING

The estimated and final cost of the Performance Monitoring Period is summarized in Table 8-3, assuming that the initial estimated period for the Performance Monitoring is one year.

TABLE 8-3

Summary of PMP Final Cost (October 1998 to September 2000)

	Source of Cost Estimates for One Year Period	Estimated Cost	Actual PMP	Actual End Date to Complete all PMP Work	Actual Cost as Estimated to be Work Done During the PMP
SBMWD	Cooperative Agreement for operating the treatment system and performing monitoring during LTRA	$906,000	Oct 1998 through Oct 2000	April 2002 (for all repair work)	$2,046,616[a]
URS	Workplan Task 9 for actual performance monitoring	$387,687 (WA #015) $211,123 (WA # 115)	Oct 1998 through Present	January 2004 (for all PMP reports)	$399,787[b] (WA #015) $90,338[b] (WA # 115)

[a] This amount includes the cost of repair for the various components identified in the letter of September 29, 2000, which is $809,206, plus two years of operational expenses totaling $1,237,410 for the SBMWD from October 1998 through September 2000. These two years of operation would normally be included in the LTRA, but due to the repair work, they were instead included as part of the Operational and Functional period, which is part of the construction activities (RA activities) for SBMWD. This two-year cost is also lower than routine LTRA cost due to no maintenance and no carbon change required during this time period.

[b] These two amounts are for Task 9 in both Work Assignments, covering from October 1998 through the present time (as invoiced through 07/30/04). While SBMWD is in charge of the actual operation of the treatment system, URS provides the monitoring during the PMP and all PMP reports. Due to the format of the Workplans, the period of performance is only relative, since cost is based on actual work performed. After the PMP, the monitoring for the Newmark OU is combined into the Site-Wide Monitoring Program, as part of the Source OU Semi-annual monitoring effort.

9.0 OBSERVATIONS AND LESSONS LEARNED

9.1 COST OBSERVATIONS AND LESSONS LEARNED

The O&F period took two years to complete, partly due to the problems found during this period as listed in the letters in Appendix C. All of the solutions to these problems have been implemented during the Muscoy OU construction activities.

9.2 OFF-GAS CORRECTIVE ACTIONS

Shortly after startup and during operation of the treatment plants, the systems started experiencing excessive pressure build-up, which resulted in reduced flow rates and gas releases into the atmosphere through pressure relief valves on the vessels. A study was conducted to determine whether the released air was a health hazard. The data concluded that there was no appreciable risk to the community. The study also was designed to determine a possible solution to the excessive off-gassing. It became apparent that the off-gassing was caused by the formation of large pockets of air within the carbon that prevented the flow of water through the carbon. The air binding problem was resolved by increasing the vessel pressure to keep the air in solution in the water. Automatic pressure-sustaining valves were installed to continuously maintain the proper pressure in the GAC vessels. This resulted in a practical elimination of air discharged from the air release valves. The Air Monitoring Report associated with these activities is provided in the second PMP report, *Newmark Plume Operable Unit Remedial Action, Newmark Groundwater Contamination Superfund Site, Project Performance Report* (URS, 2004).

9.3 OTHER OBSERVATIONS AND LESSONS LEARNED

Several components of the facilities' electrical systems were repaired and replaced during the Operational and Functional Period. A letter issued on September 29, 2000 (see Appendix C) detailed the repair work that was identified during the Operational and Functional period, and which still needed to be completed as of the end of the official Operational and Functional period (ending September 29, 2000), with an estimate of funds needed for each type of work. These remaining work do not affect the performance of the system, which has been performed as designed (see the two Project Performance Reports, URS 2000b and URS 2004), and so the Newmark Operable Unit was transferred to SBMWD to start the Long Term Remedial Action (LTRA) period. A second letter issued on April 2, 2002 officially concludes all construction repair activities on site (See Appendix C).

The final cost of the all the repairs amounted to $809,206, as shown in Table 8-1. The period of Performance Monitoring to determine Operational and Functional lasted two years, with the repair work lasting until 2002. All the issues identified in the above two letters were addressed during the Muscoy OU design period to incorporate all the lessons learned from the Newmark OU construction.

This page intentionally left blank

10.0 POINTS OF CONTACT

U.S. EPA Project Manager:

Dr. Kim Hoang
Remedial Project Manager
Superfund Division
U.S. Environmental Protection Agency
75 Hawthorne Street (SFD-7-4)
San Francisco, CA 94105-3901
(415) 972-3147

URS Site Manager:

Dwayne Deutscher, PE
URS Group, Inc.
2870 Gateway Oaks Drive, Suite 300
Sacramento, California 95833
(916) 679-2051

SBMWD Project Manager:

William Bryden
City of San Bernardino Municipal Water Department
300 North “D” Street
San Bernardino, CA 92418
(909) 384-5107

DTSC Project Manager:

Dr. Yasser Aref
Dept of Toxic Substances Control
5796 Corporate Ave.
Cypress, CA 90630
(714) 484-5349

This page intentionally left blank

11.0 REFERENCES

URS, 1993. *Remedial Investigation/Feasibility Study Report for Newmark RI/FS Groundwater Contamination Project*. March.

URS, 1998a. *Performance Monitoring Program Field Sampling Plan Addendum to the Source OU LTMP Field Sampling Plan for Newmark Groundwater Contamination Superfund Site, Newmark OU Remedial Action*. Prepared for U.S. EPA, Region IX.

URS, 1998b. *Extraction System Monitoring Well Installation Technical Memorandum.* April.

URS, 2000a. *Draft Second and Third Quarter 1999 Report for Newmark Groundwater Contamination Superfund Site, Source Operable Unit, Long-Term Monitoring and Sampling Program*. August.

URS, 2000b. *Newmark Plume Operable Unit Remedial Action, Newmark Groundwater Contamination Superfund Site, Final Six-Month Operation Report. Newmark Groundwater Contamination Superfund Site, San Bernardino, California*. August.

URS, 2004a. *Project Performance Report for the Newmark Plume Operable Unit Remedial Action, Newmark Groundwater Contamination Superfund Site.* January.

URS, 2004b. *Newmark Operable Unit, Newmark Groundwater Contamination Superfund Site Cost and Performance Report*. September.

URS, 2004c. *Newmark Operable Unit, Newmark Groundwater Contamination Superfund Site Operation, Maintenance, and Performance Manual*. September.

United States Environmental Protection Agency (EPA), 1993. *Newmark Operable Unit Record of Decision: Interim Remedy*. August.

This page intentionally left blank.